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NUCLEAR OPERATIONS

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NUCLEAR OPERATIONS

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PREFACE

In the past, Soviet-styled armored echeloned formations were the primary threat to the United States (US). In response to this threat the US designed and stockpiled tactical nuclear weapons. Today's threats consist of regional instabilities and the proliferation of weapons of mass destruction (WMD). However, the US, as well as many other nations, actively pursues a policy of nonproliferation. Despite this, the number of nations who have, or are developing, nuclear weapons continues to grow. Therefore, the US may some day find itself confronted by an opponent who possesses nuclear weapons. Because of the continuing reduction in the size of US military forces, the US could also find itself opposed by an overwhelming conventional threat. Either scenario could lead to the use of nuclear weapons. Therefore, the US must concern itself with countering the proliferation of weapons of mass destruction.

Despite the continuing drawdown of US military forces, the current national military strategy includes fighting and winning two near-simultaneous regional wars with conventional forces. Any US threat of employing nuclear weapons is to deter a potential adversary's use of such weapons. If deterrence fails. the goal is to end hostilities on terms acceptable, at the lowest level of conflict, to the US and its allies. However, the US unilaterally reserves the right to use nuclear weapons if necessary. Use would be restricted, of course, with tight limits on the area and time of use. This would allow the belligerent to recognize the "signal" of limited response and to react accordingly.

The Army describes battlefield nuclear warfare (BNW) in terms of being able to conduct continuous combat operations in a nuclear environment. The presence of any nuclear-capable system, before, during, or after nuclear-weapons employment by either friendly or enemy forces, creates a nuclear environment. The implications of their very presence creates the nuclear environment.

Before 1991, the US Army had custody of tactical nuclear weapons which were to be employed, on Presidential release, by organic Army field artillery units. In September 1991, the Presidential Nuclear Initiative (PNI) removed the organic nuclear responsibility from the US Army. Today the Army neither has custody of nuclear weapons nor do corps and divisions employ them. The US Air Force or the US Navy are now responsible for delivery of nuclear weapons in support of Army operations. The Army retains its role in nominating nuclear targets and is also responsible for nuclear force protection.

This manual establishes Army doctrine for operations in a nuclear environment and details the doctrine for integrating nuclear considerations into all other aspects of the battlefield. It also describes the Army's role in nominating targets at corps and above levels and protecting the force from the effects of nuclear weapons detonation.

Nuclear operations may occur at strategic, operational, and tactical levels of war. Nuclear employment in a theater of operations has theater strategic, operational, and tactical results; execution has national strategic implications. The corps' role is to function at either the tactical or operational levels of war. At the tactical level, the corps accomplishes missions as Field Manual (FM) 100-15 describes. At the operational level, when directed and augmented, the corps functions as either the Army force (ARFOR), the joint force land component command (JFLCC), or a joint task force (JTF). By viewing the corps in its many possible roles, the reader can also discern nuclear procedures for echelons above corps (EAC) and joint missions.

This manual can help educate and train commanders and staffs at corps and operational levels in nuclear operations and educate and train divisions in nuclear force protection. It is used with Joint Publications (JP) 3-12.1, 3 -12.2 (SRD), or 3-12.3, and serves as the bridge between joint and

DETERRENCE

Although the US military force's overriding mission is to deter war, especially nuclear war, the intent behind the 1991 Presidential Nuclear Initiative (PNI) was to enhance national security through arms reduction while preserving the capability to regenerate selected forces if required. Recent arms control agreements and unilateral initiatives provide for real reductions in the arsenals of nuclear powers. However, even with the most optimistic outlook, the sheer number of remaining weapons is formidable. An increasing number of potentially hostile states are developing or have the capability to develop weapons of mass destruction. Therefore, the US must maintain a modem, reliable, and fully capable strategic deterrent as its number one defense priority.

Deterrence is the product of a nation's military capabilities and that nation's willingness to use those capabilities. The US' policy is to terminate conflict at the lowest possible level of violence consistent with national and allied interests. The ability to conduct operational- and tactical-level nuclear activities enhances US deterrent policy.

The potential employment of nuclear weapons at theater level, when combined with the means and resolve to use them, makes the prospects of conflict more dangerous and the outcome more difficult to predict. The US' position is that it can achieve deterrence if any potential enemy believes the outcome of nuclear war to be so uncertain, and the conflict so debilitating, that he will have no incentive to initiate a nuclear attack. The resulting uncertainty reduces a potential aggressor's willingness to risk escalation by initiating conflict.

At the same time, a credible defensive capability, which would include the threat of employing nuclear weapons, could bolster the resolve of allies to resist an adversary's attempts at political coercion. For example, the US' capability of responding to biological and chemical attacks with nuclear weapons would likely reduce or eliminate such attacks.

Nuclear weapons contribute to but do not by themselves ensure deterrence. To have a credible nuclear deterrent requires a nation to have the means, the ability, and the will to employ nuclear weapons. The nation must also have—

- A reliable warning system.
- A modern nuclear force.
- The capability and flexibility to support a spectrum of response options.
- A deployable defensive system for theater protection.

The threat of nuclear escalation is a major concern in any military operation involving the armies of nuclear powers. Controlling escalation is essential to limiting a rational threat's incentive for nuclear response. Escalation control involves a careful selection of options to convey to the enemy that, although the US is capable of escalating operations to a higher level, it has deliberately withheld strikes.

The US views restraint in the use of nuclear weapons as an important way to control the escalation of warfare. Restraint provides leverage for a negotiated termination of military operations. However, the US cannot assume a potential enemy will view restraint in the same way, or that he will not employ weapons of mass destruction. Therefore, the US must be capable of deploying those forces necessary to defeat aggression, provide coercion, and bring the war to a speedy termination on terms favorable to the US and its allies. Commanders and staffs at all levels must continue to be familiar with nuclear-weapons effects, the actions required to minimize such effects, and the risks associated with using nuclear weapons.

THE THREAT

The Cold War era's definitive threats to American security were nuclear surprise attack and the possible invasion of Western Europe. The new threat is worldwide regional instability (including the possible regional use of nuclear weapons) coupled with the proliferation of weapons of mass destruction.

Developing countries as well as regional powers are gaining the ability to manufacture nuclear arsenals. The current threat from developing nations primarily consists of short- and intermediate-range ballistic and cruise missiles and aircraft capable of carrying nuclear weapons and other weapons of mass destruction. Other threats, such as terrorists groups, may also possess nuclear weapons.

A nation that has the capability of using ballistic or cruise missiles and high-speed aircraft to deliver weapons of mass destruction at extended ranges

significantly increases those weapons' effectiveness as instruments of terror. Such capability also enhances the possibility of conflict escalation beyond a hostile region's boundaries.

The use of, or the threat of using, weapons of mass destruction within a campaign or major operation can cause large-scale shifts in objectives, phases, and courses of action (COA). Nuclear weapons make it possible to drastically change the effective ratio of regional forces and equipment and to create conditions favorable to a threat's operations. Consequently, if a potential adversary is not successful conventionally, he might consider using weapons of mass destruction.

The most accepted enemy employment methodology to destroy critical targets is surprise. A potential enemy might try to destroy massed units and all other critical targets using various nuclear-weapons burst options (space bursts, air bursts, surface bursts, below-surface bursts). Such attacks might be single attacks or part of a group of massed nuclear strikes. Therefore, retaliation or escalation would result in the likelihood of nuclear use against friendly forces. Or, retaliation or escalation could be used in response to an enemy's first use of weapons of mass destruction.

One element of the commander's critical information requirements (CCIR) is determining if the theater threat is capable of using weapons of mass destruction. The answer dictates future command actions.

PROLIFERATION, NONPROLIFERATION, AND COUNTERPROLIFERATION

Proliferation is the process by which one nation after another comes into the possession of or attains the right to determine the employment of nuclear weapons, each potentially able to launch a nuclear attack upon another nation. Nonproliferation efforts focus on preventing the spread of missiles and weapons of mass destruction through arms and export controls beyond the scope of corps and EAC interest. Counterproliferation strategy focuses on military measures centering both on how to deter or discourage as well as how to defend and attack against the possible use of such weapons.

The Department of Defense's (DOD) counterproliferation initiative recognizes the goal of preventing proliferation of weapons of mass destruction and their associated delivery systems. It also recognizes that the US must continue to expand its efforts to protect forces, interests, and allies. The initiative has two fundamental goals:

- To strengthen DOD's contribution to governmentwide efforts to prevent, or diplomatically reverse, the acquisition of weapons of mass destruction.
- To protect US interests and forces (as those of its allies) from WMD effects by assuring that US forces have the equipment, doctrine, and intelligence needed to confront, if necessary, any future opponent who possesses weapons of mass destruction.

The Department of Defense marshals its unique technical, military, and intelligence expertise—

- To improve arms control compliance.
- To control exports.
- To inspect and monitor the movement of nuclear materials.
- To interdict shipments for inspection during crises.
- To strengthen the norms and incentives against WMD acquisition.

The Department of Defense's acquisition strategy in the areas of command, control, communications, and intelligence (C^3I), counterforce operations, active defense, and passive defense address the following critical counterproliferation challenges:

- Detecting and destroying WMD capabilities from production through storage to deployment.
- Conducting military operations in a WMD environment.
- Dealing with consequences of WMD use, including medical treatment, clean-up, and recovery.
- Coping with the diffusion of new technologies.

NOTE: This manual concerns the nuclear part of weapons of mass destruction.

Although nuclear weapons are an element of deterrence, potential regional adversaries might or might not understand the deterrence value of the

US' nuclear weapons. If the goals of promoting peace, deterring war, and resolving conflicts fail, deterrence fails. Therefore, fighting and terminating hostilities become paramount. United States doctrine assumes that if the potential foe is capable of using weapons of mass destruction, then US forces must act accordingly.

NUCLEAR FORCES

Nuclear-capable forces (Navy and Air Force) are instruments of national power in regional conflicts. They contribute to theater deterrence or provide a war-fighting option to the NCA.

Because the Army no longer has an organic nuclear capability, the Navy or Air Force will provide nuclear support. The Army can now only nominate nuclear targets, usually at no lower than the corps level. The division normally is limited to NBC protection activities.

The capability of the US to deploy nuclear forces into a theater significantly complicates the enemy's planning process. The alert status of nuclear forces is a function of the world situation at any given time and, thus, enhances their responsiveness.

LEADERSHIP

Battlefield stress in a nuclear environment will be higher than US forces have ever experienced. Only disciplined, well-trained, and physically fit units can function well in such an environment. Commanders who understand this and who provide soldiers with strong, positive leadership; good mental and physical preparation; and clear, comprehensive plans will ensure soldiers are in a better position to survive and win.

Units may have to operate with reduced mutual support and fire support, with degraded electronic communications abilities along extended lines of communications (LOC), and possibly without centralized control or continuous communications. Therefore, to improve command and control (C^2) leaders must work toward three general goals (which take on added importance in nuclear operations):

1. Instill an aggressiveness in their units that will transcend the shock and stress of the nuclear environment.
2. Train junior leaders to think and operate independently.
3. Develop small-unit cohesion.

Commanders and staffs must fully understand the potential of nuclear-weapons use by both an adversary and by a US joint force. They must also have a working knowledge of—

- Nuclear-weapons effects.
- Employment doctrine.
- Survivability measures necessary to preserve combat power.
- Medical requirements as a result of a nuclear explosion.
- The psychological impact of nuclear warfare on soldiers and units.

As commanders plan and fight successive battles involving actual or possible nuclear operations, they must continually assess their soldiers' psychological and physiological stresses. Commanders must emphasize situations in training, exercises, and leadership which will help soldiers accomplish their missions.

TRAINING

On a nuclear battlefield every soldier will confront new and strange circumstances and be under constant danger of attack. Nuclear weapons will quickly cause many casualties as well as intermediate and long-term radiation effects. Soldiers will be exposed to death and destruction of a magnitude far beyond imagination and may have to operate in widely dispersed, isolated, and semiindependent groups. Everyone must understand and practice survival and mitigation techniques. Such techniques will give soldiers direction and confidence in a confusing, frightening situation.

The large and sudden losses that a nuclear attack will cause will shock and confuse inadequately trained or psychologically unprepared troops. Reaction times will be slower, and the ability to respond to leadership and the desire to perform at peak proficiency may be degraded. The violence, stress, and confusion can easily divert attention from battlefield objectives. Extraordinary discipline and leadership are vital to overcoming distractions,

maintaining the mission's focus, and pressing the fight.

Training, the cornerstone of success, technically and psychologically prepares soldiers for the nuclear environment. Successful nuclear operations require expanded combat training that includes—

- Mitigation techniques against nuclear effects.
- Radiation monitoring.
- Decontamination techniques.
- Operations exploiting nuclear-weapons use.
- Recovering and regrouping after an attack.
- Handling mass casualties.
- Having to use degraded resources to accomplish the mission.
- Nominating nuclear targets.

Soldiers will fight as well or as poorly as they have been trained. Clear, concise policies and guidelines provide control and direction. Commanders must emphasize the fact that aggressive maneuver, even by relatively small units, will have a high probability of success in the confused aftermath of a nuclear attack.

NOTE: See FM 25-50 for in-depth discussions of these topics.

SUMMARY

This chapter describes the transition of joint nuclear doctrine to Army-oriented nuclear doctrine. A nuclear environment exists if either adversary in the conflict possesses nuclear capabilities. The levels of war clarify simultaneous activities Army forces conduct in the theater. Each level supports the next higher level of war.

The overall mission of military forces is to deter war—especially nuclear war. If deterrence fails, the US must be capable of deploying the forces necessary to defeat aggression, provide cohesion, and bring war to a speedy termination on terms favorable to the US and its allies.

The threat is worldwide regional instability (including possible use of nuclear weapons) coupled with the proliferation of weapons of mass destruction. Proliferation occurs when nations acquire and have the ability to use nuclear weapons against another nation. Nonproliferation activities attempt to prevent the spread of weapons of mass destruction. Counterproliferation centers on how to deter, defend, and attack against possible use of nuclear weapons.

In the event of either friendly or enemy nuclear-weapons use, commanders must provide soldiers with strong positive leadership, good mental and physical preparedness, and clear comprehensive plans. Positive leadership will ensure soldiers survive and win. Training is the cornerstone for success.

Chapter 2

EMPLOYMENT CONSIDERATIONS

WEAPONS EFFECTS AND THE COMBAT ENVIRONMENT

Nuclear weapons add significantly to the physical and psychological environment of combat. They cause intense, violent effects which severely affect unit movement, employment, and protection. Commanders at all levels must understand the operational and tactical implications of the nuclear environment and its effect on operations.

The basic effects of a nuclear detonation are blast, thermal radiation, residual ionizing radiation, initial radiation, and electromagnetic pulse (EMP). These effects can destroy or neutralize targets as well as impair, through physical injury, the operational capability of personnel. Flash blindness, radiation sickness, eardrum rupture, and second-degree burns are some of the injuries persons might experience.

Weather, terrain, surface conditions, and man-made structures modify nuclear-weapons effects. Also, conditions existing naturally on the battlefield at any given moment can enhance or mitigate such effects. Therefore, commanders must adequately prepare and train their units for all possibilities.

NOTE: See JP 3-12.2 (SRD) (for US military forces only), JP 3-12.3, and DA Pamphlet (Pam) 50-3 for in-depth discussions of nuclear effects.

Blast

The blast wave (static overpressure and dynamic pressure) from a nuclear air burst mostly causes materiel damage. Surface and subsurface bursts generally produce less air-blast damage and more cratering.

Most data on blast effects describe blasts as observed on flat or gently rolling terrain. There is no quick and simple method for calculating changes in blast pressures in hilly, mountainous, or forested terrain. In general, compared to the same distance on flat terrain, pressures are greater on the forward slopes of steep hills and lower on reverse slopes.

Line-of-sight (LOS) shielding is not dependable; blast waves can bend or diffract around obstacles. Hills may decrease dynamic pressure and offer some local protection from flying debris. However, small hills or folds in the ground are considered negligible for target analysis. Wooded hills lessen dynamic pressure, but do not significantly affect overpressure. Wooded hills will also produce significant wood splintering, tree blowdown, and forest fires.

The reflecting nature of a surface over which a weapon detonates significantly influences the distance to which blast effects extend. Smooth, reflecting surfaces such as ice, snow, sand, moist soil, and water reflect most of the blast energy, maximizing its effects. Conversely, surfaces with thick, low, combustible vegetation; dry soils with sparse vegetation; and desert sand minimize such effects.

Built-up areas do not significantly affect a blast wave's effects. And, even though urban structures may provide some local shielding from flying debris, they can also increase pressures by channeling a blast wave.

Weather conditions also affect blast damage. Rain and fog lessen the force of the blast wave by increasing air density and moisture. These conditions help dissipate the energy of the blast wave as it moves through the heavier air.

Thermal Radiation

A fireball's intense heat possesses high thermal energy that, as thermal radiation, is transmitted from the point of detonation over a wide area. Thermal radiation travels at wavelengths from ultraviolet to infrared. The atmosphere absorbs some of the ultraviolet radiation; therefore, the prime source of thermal radiation is the infrared.

Thermal radiation can ignite materiel and cause serious burns. However, the effect of thermal radiation on a target is influenced by many factors, including the state of the atmosphere and the target's thermal absorption qualities (color, thickness, consistency, and reflective properties). For example, when a weapon detonates below an overcast sky, the underside of the cloud layer acts as a reflector.

The reflected energy is then added to that coming directly from the point of explosion.

The differing levels of energy released from the various-yield weapons further complicates the use of thermal effects for targeting. The level of energy released is not the only effect; the rate at which it is released also has impact. Smaller weapons release thermal energy relatively quicker than larger ones. Also, larger weapons generate heat more slowly, taking longer to dissipate or be conducted away. Therefore, the total amount of thermal energy available for a given type of weapon is directly proportional to its yield.

Although not a basic effect, flash blindness is a phenomenon that soldiers might experience from the thermal effect from a nuclear explosion. Flash blindness takes two forms—dazzle and retinal burns.

Dazzle is the most common form of flash blindness. Its effect is similar to the temporary blindness that camera flash bulbs or bright car headlights at night cause. The difference is in intensity. Dazzle effects from a flash bulb are a temporary inconvenience. Effects from a nuclear burst are prolonged and cause far greater loss of vision. Looking directly at a burst causes severe impairment of vision for from 2 to 3 minutes by day to over 10 minutes at night when the pupils are fully dilated. Two minutes is a long time on a battlefield and seems longer to pilots fIying high-speed aircraft.

The second and more serious form of flash blindness results from retinal burns received when the lens of the eyes focus the image of the fireball onto the back of the eyes. Estimates of the risk of retinal burns vary. Small pinpoint retinal burns may heal in time, but greater damage is unlikely to do so and will leave a permanent blind spot in the affected eye. Some sources believe that only a small percentage of troops will receive such injuries; others believe this could be a more serious threat.

Residual Ionizing Radiation, Initial Radiation, and the Operational Exposure Guide (OEG)

Residual ionizing radiation typically occurs after the first minute of detonation. It primarily consists of energized impurity particles and debris falling back to earth because of air movement and/or rainout. Residual ionizing radiation could be a lingering and widespread operational hazard.

Within the first minute after a nuclear-weapon detonates, initial radiation, in the form of x-rays, gamma rays, and neutrons, is emitted. Initial radiation travels at nearly the speed of light and can penetrate and damage materiel and injure personnel. Initial radiation can help defeat the enemy, but it can also endanger friendly forces and the local civilian population.

Denser air at sea level absorbs more initial radiation than thinner air at higher altitudes. As the height of burst (HOB) or the temperature of the air increases, the air density decreases. This allows initial radiation to extend farther because it is less absorbed by air molecules.

An important factor influencing the amount of initial radiation a target receives is shielding. For example, the surrounding ground, acting as an absorber or shield, will sharply reduce the initial radiation from surface and subsurface bursts. Terrain features can greatly influence initial radiation effects. Minor irregularities, such as ditches, gullies, and small folds in the ground, offer some protection. Major terrain features, such as large hills and forests, can provide significant protection for equipment and personnel, depending on the height of burst.

People inside buildings, tanks, or individual fighting positions receive lower initial radiation doses than people in the open and at the same distance from the nuclear detonation. How much less depends on how much initial radiation the intervening material absorbs. All material absorbs some nuclear radiation. However, because of the high penetrating power of neutrons and gamma rays, the shielding material must be quite thick to provide significant protection.

Dense materials such as armored vehicles offer excellent protection against gamma rays. Some readily available low-density materials offer the best protection against neutrons. Depending on its moisture content, soil may also be a good neutron shield. For example, an individual fighting position with 1 meter of overhead soil protection will shield its occupant from as much as 98 percent of the neutron radiation.

Material sufficient to protect against gamma rays also provides some protection against neutrons. As

a general guideline, soldiers can construct shields of minimum thickness meant to absorb both neutrons and gamma rays by either alternating layers of high- to low-density materials or by thoroughly mixing such materials.

Units may encounter nuclear contamination from sources other than weapons detonation. Possible sources include fallout caused by the destruction of an enemy's nuclear weapons production facility, enemy stockpiled weapons, and nuclear energy reactors (both friendly and enemy).

Another source of contamination would be the deliberate spread of radioactive materiel over friendly forces or terrain. A nuclear environment can be created without the introduction or detonation of a yield-producing weapon. Therefore, commanders at all levels must be aware of this possibility as well as the possibility of the contamination from non-weapons sources that could significantly affect operations.

NOTE: See FM 3-15 and the FM 3-series manuals for a description of actions to counter these events.

The operational exposure guide (OEG), expressed in terms of negligible or emergency risk criteria, is the key to nuclear contamination avoidance. The OEG gives the commander a flexible system of radiation exposure control. The commander specifies OEG for his unit's level of radiation. The level of exposure must be kept as low as possible. Based on the stated OEG, leaders can select units with low radiation exposure to perform necessary missions.

Establishing and using OEG procedures helps leaders successfully employ units on a radiologically contaminated battlefield while keeping exposure to the minimum extent possible consistent with the mission. Ignoring exposure control would be disastrous.

Electromagnetic Pulse (EMP)

On impact with the earth's atmosphere or with solid materials, initial radiation liberates free electrons. The free electrons create two additional effects: the EMP and the transient radiation effects on electronics (TREE). The EMP can severely degrade and destroy unprotected command, control, communications, computers, and intelligence (C^4I) operations.

Electromagnetic pulse directly injures personnel only if they are physically touching metallic collectors, such as cables, at the time of an EMP surge. Hazards may also exist from indirect or secondary EMP effects. For example, damaged electronic equipment might catch fire. Also, pilots may receive incorrect information from digital instruments upset by EMP. Appropriate standing operating procedures (SOP) help mitigate secondary effects.

Both EMP and TREE can burn out electronic components or upset system operations. Upset conditions can occur at low signal levels because permanent damage occurs when currents induced by EMP and TREE exceed the capacity of a particular circuit within a system. Shielding sensitive electrical and electronic components is the best protection against burnout. For example, disconnecting antenna cables when the equipment is not in use is a recommended mitigation technique for EMP in field operations.

High-altitude nuclear bursts ionize the atmosphere and cause serious widespread blackout of high-frequency (HF) shortwave and synchronous satellite relay communications. Blackouts can last from a few minutes to several hours.

In highly ionized regions caused by low-altitude bursts, blackout interference generally decreases as EMP frequency increases. (Most EMP energy is at frequencies below 100 megahertz.) Blackouts from low air bursts are usually not significant. Dust-laden clouds from low air bursts cause blackout effects lasting from a few seconds to several minutes at most, and then only when a fireball or dust cloud blocks transmission paths. Actual interference depends on how many nuclear bursts occur, the altitudes at which they occur, and the areas over which they occur.

Units can reduce blackout by—

- Using wire communications systems. (However, a system with wires, especially long wires, is more susceptible to EMP.)
- Routing radio communications through a retransmission station or manual relay to bypass the blackout region.
- Assigning alternate frequencies. (If the signal operations (SO) officer suspects that an ionized region is producing interference, he tries higher

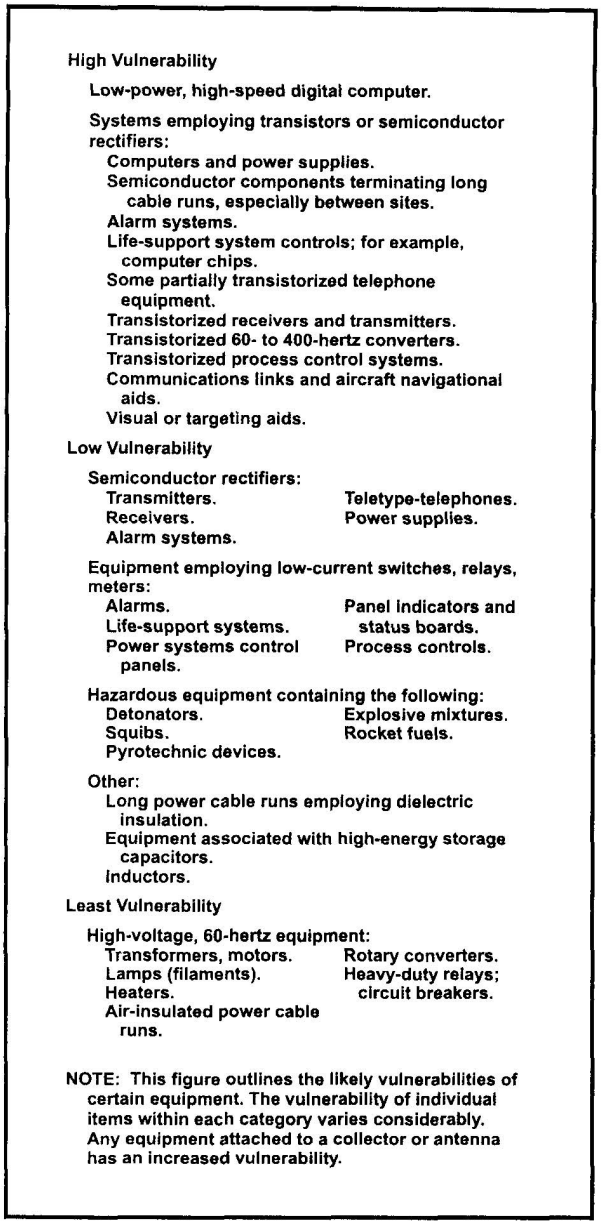

Figure 2–1. Range of vulnerability to EMP effects

frequencies first. When it appears dust is the problem, he tries lower frequencies.)

Figure 2-1 shows the range of vulnerability (which varies significantly within each category) for some common types of equipment. Communications equipment operators use the following general rules to make rough estimates of the electronic equipment's EMP vulnerability:

1. Any system that employs high-speed, integrated technology (such as personal computers) are considered vulnerable to EMP and TREE if operated in an unshielded environment.
2. Older equipment that uses discrete components of semiconductors and transistors are less likely to be susceptible to EMP damage than state-of-the-art equipment.
3. Equipment with large collectors is more susceptible to EMP damage than equipment with smaller collectors because the EMP energy collected is a strong function of the surface area exposed to EMP.
4. Unhardened radios operating at frequencies of 100 megahertz or below, such as HF systems, have a higher probability of EMP damage than communications equipment which operates at higher frequencies.

NOTE: None of these rules apply to EMP-hardened equipment. The hardness, or vulnerability level, of specific items of equipment is classified. For more information, see JP 3-12.2 (SRD).

UNIT SURVIVABILITY

Survivability operations take on increased importance in a nuclear environment. The destructive power of nuclear weapons requires new measures to reduce vulnerability and to increase survivability. The commander must employ appropriate collective NBC protective measures given the unit's mission and the threat it faces.

NOTE: See also JP 3-12.1.

The commander also promotes survivability, at least to forward elements of close combat forces, by closing with the threat. Commanders should use a scheme of maneuver that contributes both to the combat objective and to survivability; for example, infiltrating at multiple points and conducting spoiling attacks.

Commanders must rapidly assess nuclear effects and determine appropriate actions and responses. The immediate impact on combat power can degrade the forces's ability to accomplish current and future missions. The commander must also determine long-term effects on future operations. Concerns at all levels are—

- Restoration of C^2, intelligence, and logistic systems and capabilities.
- How the enemy exploits the nuclear strike.
- Decontamination of personnel and equipment.
- Combat health support (CHS) response requirements.
- Radiation exposure levels of subordinate units.
- Contaminated areas.
- Craters and obstacles created by blast and radiation effects.
- Protecting the force by adhering to OEG.

NOTE: See FM 3-4, Chapter 4, for a detailed discussion of individual protection.

Survivability operations, using sound active and passive protective measures and practices, are intended to protect friendly forces from the effects of enemy weapons systems. Sound survivability practices reduce a force's vulnerability to detection, to attack (if detected), and to destruction (if attacked).

However, measures to reduce vulnerability to one form of attack may increase vulnerability to other forms of attack and might detract from the overall effectiveness of the force. For example, dispersion may reduce vulnerability from nuclear attacks but increase vulnerability to infiltration and invite defeat in detail. Positioning (dispersion), mass versus dispersion, countermeasures, and mitigation techniques all lead to unit survivability.

Positioning (Dispersion)

Positioning or dispersion can enhance survivability. However, dispersing combat units in direct proportion to a threat's nuclear weapons and yields is neither possible nor desirable. The degree of dispersion possible should be that which permits mission accomplishment while not subjecting the force to an unacceptable risk from attack. The difficulties with dispersion include movement of equipment, coordination, and supportability.

Although dispersion can enhance a unit's survival, it can also restrict tactical flexibility and inhibit mobility. Dispersion reduces vulnerability, but dispersion beyond the range of effective C^2 reduces combat power and increases the possibility of mission failure.

Mass Versus Dispersion

Because measures that enhance survivability reduce combat power, the commander must carefully manage active and passive protection measures. (Dispersion is an example of the former, camouflage of the latter.) Protective measures contribute to battlefield success, but they cannot ensure it. Massing effects on a target rather than massing forces significantly reduces the risk to the command.

When a threat possesses nuclear weapons, US forces conduct operations in anticipation of their use. The commander maintains his ability to disperse forces as rapidly as he massed them or he will present a lucrative nuclear target. This is the mass versus dispersion dilemma.

NOTE: See FM 3-3-1 for tactics, techniques, and procedures (TTP) on solving the mass versus dispersion dilemma.

Countermeasures

An antagonist having sophisticated intelligence systems is a great threat because it can—

- Monitor friendly communications.
- See the battlefield from overhead.
- Locate emitters and control agents deep in rear areas.

Countermeasures employ devices or techniques to impair the operational effectiveness of an enemy's activities. Countermeasures might include—

- Operations security (OPSEC), which can prevent the enemy from obtaining information about Army operations.
- Deception, which can prevent the enemy from obtaining unit location and activity information.
- Information security, which can prevent disclosure of information about unit locations and activities from written, verbal, and graphic communications sources.
- Physical security, which can prevent equipment signatures, profiles, and patterns.
- Signals security (SIGSEC), which can protect nuclear operational information by using

communications security (COMSEC) and electronic security (ELSEC) techniques.

- Analysis of information gathered through intelligence operations to predict enemy intentions.

Mitigation Techniques

Mitigation techniques are expedients the force accomplishes using only equipment and material available on the battlefield. Mitigation techniques will not totally overcome nuclear vulnerability. However, used wisely, they can lessen the vulnerability of personnel and equipment to nuclear-weapons effects. Techniques may be as simple as using anchors, tiedowns, and outriggers to build shelters; using equipment at hand to dig shelters; or using tracked vehicles as overhead cover. Techniques may also include wetting down or compacting defensive positions to enhance radiation protection.

Measures that provide security against detection also often provide some protection against nuclear attack or can minimize nuclear-weapons effects. One measure is terrain shielding, which minimizes the risks of detection as well as reducing the extent and severity of nuclear-weapons effects.

Any cover, including natural vegetation, significantly reduces thermal radiation effects and may even diminish the intensity of nuclear radiation. Hills and folds of ground between the unit and the detonation can somewhat reduce nuclear effects. Natural and man-made terrain features (individual fighting positions with overhead covers or buttoned-up armored vehicles) can also modify blast waves and lessen nuclear effects.

EQUIPMENT SURVIVABILITY

Equipment survivability in a nuclear environment begins with the materiel-acquisition process before hostilities begin. Equipment must be able to withstand the initial effects of a nuclear weapon and still accomplish its mission.

The commander should not confuse nuclear survivability with NBC-contamination survivability. The latter is the capability of a system and its crew to withstand an NBC-contaminated battlefield, including one with residual ionizing radiation, without losing the ability to accomplish its mission.

The Army's goal is for soldiers who survive exposure to nuclear-weapons effects to retain their mission-essential equipment in a condition which would enable them to complete their missions. Equipment failure must not disarm soldiers who could otherwise continue their missions.

Methods and Techniques to Enhance Survivability

Units can ensure the survivability of their equipment by—

- Avoidance (using mobility, concealment, and deception to avoid attack).
- Redundancy (proliferating so many systems or components on the battlefield that the loss of a few would not affect the mission).
- Reconstitution (possessing the ability to repair or replace equipment on the battlefield in enough time to complete the mission).
- Mitigation (employing field-expedient techniques which soldiers and units can readily accomplish using only what is available.
- Hardening (designing equipment to withstand exposure to nuclear-weapons effects).

The best approach to equipment survivability is usually some combination of these means. The commander should consider all of them. Some means increase survivability against conventional as well as nuclear threats, Nonetheless, given the unique and often far-reaching effects of nuclear weapons, some degree of nuclear hardening is the best approach in most instances.

Balanced survivability is the essence of the Army's philosophy. Survivability of mission-essential equipment must be balanced with that of crew survivability. It implies specific requirements to make crew-served equipment or systems as survivable as the crew—but no more survivable than the crew—and only in environments of tactical significance.

NOTE: See FM 3-3-1 for detailed TTPs for nuclear-contamination avoidance.

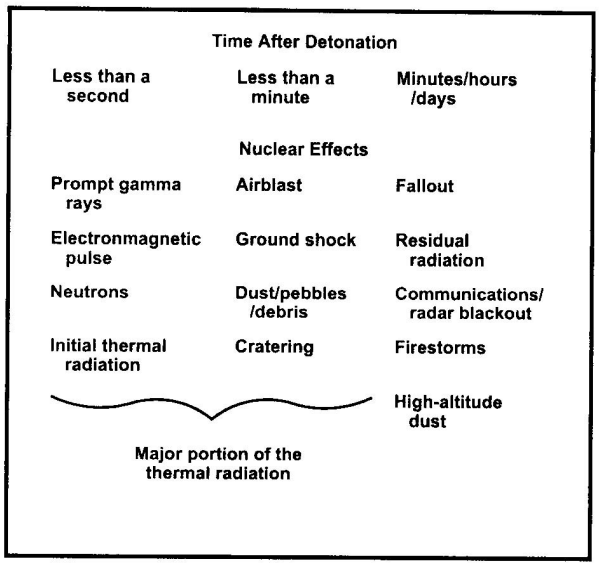

Figure 2–2. Arrival times of nuclear effects

Nuclear Environment Arrival Times

The commander must also be aware of the arrival times of different nuclear effects on the battlefield. This knowledge is critical to a system's response and survivability. Nuclear effects fall into three general time frames:

1. Effects which almost instantaneously arrive after detonation.
2. Effects which arrive within the first few seconds to minutes.
3. Effects which typically take from minutes to hours or even days to arrive.

NOTE: See Figure 2-2.

DYNAMICS OF COMBAT POWER

The dynamics of combat power—maneuver, firepower, protection, and leadership—are vital. Nuclear-weapons use by either side adds another dimension to each of these elements. Nuclear weapons greatly increase a force's warfighting potential, but they can also present new operational challenges and dilemmas. Figure 2-3, page 2-8, describes how each of the basic effects of a nuclear weapon affects the four dynamics of combat power.

NOTE: See FM 100-15 for an in-depth discussion on the dynamics of combat power.

Possibly the greatest, and least understood, challenge confronting the Army is how to accomplish the mission following nuclear-weapons use. This challenge is difficult but not impossible; the key is the quality of leadership and the capability to operate in a nuclear environment.

Leadership and training may prove to be the deciding factor in future conflicts. Knowledge of the special physical and psychological hazards of the nuclear battlefield, and doctrinal guidance and training to counter these hazards, greatly improves the Army's ability to operate successfully.

SUMMARY

Commanders and their staffs understand that, when planning operations, the use or possible use of nuclear weapons has specific, tangible implications that go beyond the actual effects of a detonation. Nuclear weapons are highly destructive and have harmful effects that other weapons do not have. Commanders must plan for and implement measures to mitigate such effects.

Commanders must also know how nuclear-weapons effects can affect personnel, equipment, and the dynamics of combat power. They must plan for and implement survivability measures and techniques. Their confidence and leadership may be the deciding factor in how their soldiers survive and succeed in a nuclear environment.

NOTE: See JP 3-12.2 (SRD) for a more in-depth discussion of nuclear-weapons effects and responses. Additional detailed, unclassified data is in DA Pam 50-3. Additional classified data is in the Defense Nuclear Agency Effects Manual (DNA EM-1) (SRD), Chapter 17, Section IV.

Dynamics of Combat Power	Actions: Initial Blast	Residual Radiation	Radiation	Thermal	EMP
Maneuver	Creates obstacles	Creates NIGA (note)	Creates fallout	Creates flash blindness	Disrupts C^2 Disrupts intelligence Disrupts logistics
Firepower (target nomination)	Destroys equipment	Produces latent ineffectiveness on deep targets	Minimizes fallout (low air burst)	Not used	Disrupts fire control instruments
Protection	Destroys equipment	Kills soldiers	Causes fallout considerations	Increases survivability concerns	Increases mitigation requirements
Leadership	Produces mass casualties	Increases radiation status of units	Causes psychological effects on soldiers	Increases the complexity of triage with burn and blast injuries	Results in loss of C^2

NOTE: Neutron-induced gamma activity.

Figure 2–3. Basic effects of nuclear weapons on the dynamics of combat power

Collateral-Damage Prevention

The commander must always seek to avoid civilian casualties from nuclear weapons in the campaign area. The G5 determines civilian population centers and produces population overlays depicting their locations. The fire support element (FSE) uses preclusion overlays to minimize damage consistent with the commander's guidance. The USANCA NEAT uses these overlays during analysis.

The commander can reduce most collateral damage by—

- Recommending a weapon that fits within collateral-damage preclusion criteria.
- Using damage-preclusion criteria.
- Recommending a low air height of burst.
- Placing a DGZ away from the area to be protected.

NOTE: See JP 3-12.2 (SRD) for procedures to calculate collateral-damage avoidance.

Options

An option is a discrete grouping of nuclear weapons and is the basic element for providing nuclear support to the Army component. It ensures political authorities retain control of nuclear-weapons employment.

An option has specific yields. It is based on the mission, enemy, terrain (and weather), troops, and time available (METT-T); collateral-damage guidance; and constraints.

NOTE: See JP 3-12 and 3-12.1 for more information.

Operational-level and corps commanders plan and recommend options for specific geographical areas, during short time periods, and for specific purposes. However, an option's area varies with the echelon of command and its objective. At the operational level of war, the area of employment may cover several corps. In a corps this may extend from the corps FLOT to the limit of the area of operations. The numbers and types of weapons in an option will vary depending on—

- The level of command that develops it.
- The mission.
- The enemy.
- The terrain.
- Nearby population characteristics.
- Desired target effects.

Nuclear-option planning begins with mission receipt and includes four phases:

1. Pre-wartime contingency planning that is based on the type of operation and constraints.
2. Wartime planning that supplements peacetime planning based on limiting requirements, terrain, and actual threat intelligence.
3. Refinements to wartime planning that meet changing situations and which update options based on the latest threat intelligence.
4. Refinements to approved options that are based on the situations just before target nomination.

Planners develop each option along with the campaign plan and transmit both to higher headquarters for approval. Commanders up the chain of command, starting with the corps, treat the option and the plan as a single entity.

To provide the control and flexibility the NCA requires and needs, commanders at strategic, operational, or tactical levels must impose a time frame on each option. The time frame must be of sufficient length to accommodate uncertainties in intelligence and friction in battlefield conditions. Specifying a time frame helps maximize a nuclear option's benefits.

Commanders must synchronize the necessary time frame with the campaign plan. The NCA might constrain the time frame for options at the operational or tactical levels based on changes in the strategic environment. As a result, the nomination time for an option starts about 96 hours before execution.

During both offensive and defensive operations, each command echelon provides to their subordinates more detailed nuclear planning guidance based on METT-T factors. Within the limits of this guidance, the operations officer and the fire support coordinator (FSCOORD) refine the planned option to support the scheme of maneuver. This is not a one-step decision, but a continuous, dynamic process of adapting plans to meet operational require-

ments, constraints, and option parameters to provide the best effect before target nomination.

Before refinement, the nominating commander must understand the intent of his next higher commander. The commander can recommend—

- Updating target information.
- Adjusting individual aiming points within the option area.
- Exchanging higher yield weapons for lower yield weapons.
- Identifying and prioritizing aiming points.
- Coordinating nonnuclear fires with nuclear fires.

The commander nominating the option has the flexibility of selecting aiming points in the option area. This maximizes the effectiveness of the option and helps attain operational objectives. However, the commander must always consider troop safety in final aiming-point refinement, using updated collateral-damage overlays with troop-safety contours and the nuclear-weapons template. Higher commands normally state collateral-damage preclusion criteria in generalized terms and gross numbers. The nominating commander may impose more restrictive employment constraints.

BATTLEFIELD OPERATING SYSTEMS (BOS)

The basic BOS (intelligence, maneuver, fire support, mobility and survivability, combat service support, command and control, and air defense) are the same whether commanders employ nuclear weapons or not. There is no doctrinal transition period from conventional to nuclear warfare. However, commanders may have to make some changes in planning techniques and procedures to accomplish these functions on the nuclear battlefield.

Intelligence

Intelligence operations are the organized efforts of a commander to gather and analyze information about the enemy's activities. Intelligence supports operations by—

- Providing early indications and warnings of a threat's intention to employ nuclear weapons.
- Conducting intelligence preparation of the battlefield (IPB) to facilitate the targeting process.
- Developing the situation by determining if a threat is nuclear-capable.
- Developing suitable nuclear targets
- Protecting the force by disrupting a threat's nuclear operations.
- Performing the battle damage assessment.

In nuclear operations reliable and rapid collection, assessment, evaluation, and dissemination of target information is critical to the nomination process. Intelligence collection—

- Identifies a threat's intent to employ nuclear weapons.
- Locates his nuclear-capable delivery systems.
- Identifies targets vulnerable to nuclear fires.

The intelligence officer uses electronic warfare support measures (ESM) to determine a threat's intentions and to discover lucrative nuclear targets for exploitation. Electronic warfare support measures include search, interception, identification, and location functions.

Maneuver

Maneuver is movement relative to the enemy to put him at a disadvantage. Commanders maneuver forces to create conditions for tactical and operational success. Maneuver enhances the friendly force's ability to destroy the enemy or hinder his movement through the direct or indirect application of lethal power or the threat thereof. Conversely, maneuvering large forces invites attack. The commander must always consider this issue during operational planning.

Maneuver and firepower are inseparable and complementary elements. While one might be more important in one phase of an operation, both are characteristic of all operations. The commander combines them to maximize relative combat power. Nuclear weapons greatly enhance the flexibility of maneuver. They also have the potential to be the principal means of destroying a threat's will to fight. When a commander nominates nuclear weapons, maneuver exploits their

effects. The commander can also nominate nuclear weapons—

- To support his scheme of maneuver.
- To mass combat power rapidly without shifting maneuver forces.
- To delay, disrupt, or destroy a threat's forces in depth.

Fire Support

Fire support is the integration and synchronization of fire and effects to delay, disrupt, or destroy enemy forces, combat functions, and facilities in pursuit of operational and tactical objectives. The flexibility of nuclear-weapons nomination makes it possible to rapidly shift the focus and concentration of combat power over wide areas.

Operational-level and corps commanders can nominate nuclear weapons—

- To support their scheme of maneuver.
- To mass effects rapidly without shifting maneuver forces.
- To attack a threat's forces in depth.

Mobility and Survivability

Mobility operations preserve the friendly force's freedom of maneuver. Mobility missions include–

- Breaching enemy obstacles.
- Increasing battlefield circulation.
- Improving existing routes or building new ones.
- Providing bridge and raft supports for river crossings.
- Identifying routes around contaminated areas.

Nuclear weapons will cause extensive damage and may drastically alter the military aspect of terrain. Therefore, commanders must determine if using such weapons would create so many obstacles that units would spend more effort breaching them than would be worthwhile.

NOTE: See DA Pam 50-3 for a detailed discussion of nuclear-weapons effects on terrain.

Survivability operations protect friendly forces from the effects of enemy weapons systems. Hardening facilities and fortifying battle positions are active survivability measures. Chapter 2 explains this in greater detail.

Corps and division commanders can anticipate higher losses throughout the battlefield when the enemy uses nuclear weapons. Mass casualties and few available replacements will require that the commander develop plans and procedures to efficiently reconstitute combat power. This, in turn, will impact reconstitution planning.

Combat Service Support (CSS)

As the scale and complexity of Army operations increase, the importance of combat service support to their success increases as well. Combat service support to the nuclear battlefield includes providing support to sister services. Coordination is vital. Combat service support units operate at all levels of war. Chapter 6 explains this in greater detail.

Command and Control

Command means visualizing the current and future states of friendly and enemy forces then formulating concepts of operations to accomplish the mission. Command occurs from wherever the commander is, whether at a command post (CP) or in a tank moving with the main effort.

Control monitors the status of organizational effectiveness and identifies deviations from set standards and corrects them. Commanders acquire and apply means to accomplish their intents. Ultimately, commanders provide a means to measure, report, and correct performance. The corps commander must be able to make the final decision on nominated target locations before passing the information to his higher headquarters.

Reliable communications are central both to battle command and to control. This is particularly true when nominating nuclear weapons. Being able to quickly pass orders is critical. Therefore, commanders must establish methods to ensure positive command and control (such as using EMP mitigating measures, alternative nets, communications, and so on).

Air Defense

Air defense units are particularly susceptible to the effects of nuclear weapons detonations. Missiles

and their associated launchers are vulnerable to blast and thermal radiation. Radars, control vans, and missile electronics are vulnerable to EMP. Refer to Chapter 2 for survival mitigation techniques.

RECONSTITUTION

The ASCC plans and conducts operational and tactical reconstitution operations. Timely reconstitution in terms of people, organizations, command structure, and materiel is essential to continuing the mission. Reconstitution is a total process. Its major elements are reorganization, assessment, and regeneration. Weapons system replacement operations facilitate the receipt of bore-sighted equipment and qualified crews to units undergoing reorganization or regeneration.

Reorganization is the action the commander takes to shift internal resources within a degraded unit to increase its combat effectiveness. It may include such measures as cross-leveling equipment and personnel, matching operational weapons systems with crews, or forming composite units. The latter involves joining two units reduced in number to form a single full-strength unit. Commanders should maintain as much squad, crew, or team integrity as possible under the circumstances to contribute to unit cohesion and to provide a base for rebuilding if regeneration is required.

Assessment measures a unit's capability to perform its mission.

Regeneration is incremental and involves the rebuilding of a unit through—

- Replacing personnel, equipment, and supplies on a large scale. (The commander can combine personnel, equipment, and supplies to return the degraded unit to the specified level of combat effectiveness.)
- Reestablishing or replacing essential command and control.
- Conducting mission-essential training for the newly rebuilt unit.

Commanders must consider individual RES during unit regeneration. Personnel with high dose accumulation should not be assigned to units whose members have low doses. This helps battalions and companies retain equal radiation states.

NOTE: See also FM 100-9, FM 100-10, FM 12-6, FM 63-3, FM 100-7, and FM 100-16.

Regardless of measures taken to enhance force survivability, some close combat forces will suffer severe losses. The nuclear environment does not allow the luxury of long personnel and materiel pipelines and the withdrawal and rehabilitation of units. Therefore, at least initially, the commander accomplishes force reorganization, reconstitution, and restoration from residual assets.

SUMMARY

The Army's role in planning nuclear operations is the heart of Army nuclear doctrine. Planners conduct the planning process of joint nuclear operations in a deliberate manner, but in a crisis they may undertake whatever actions are necessary.

The Army also participates in force-projection operations as part of a joint force. This may include multinational forces as well. The corps headquarters can also function as a joint task force headquarters. In this role the corps takes on additional responsibilities. The corps can use the guidance in this chapter when the CINC requires target nomination.

The Army at corps and above is supported by USANCA NEAT during the planning and execution cycle. The CINC is supported by STRATLAT from USSTRATCOM. Knowledge of their actions is important to Army planners for coordination and interface.

Planning nuclear operations begins with the commander's guidance and ends with nuclear targeting and collateral-damage preclusion. The mechanism for articulating the nominated targets is an option. Specific nuclear combat functions describe particular requirements in a nuclear environment.

Reconstitution and reorganization of decimated units in a nuclear environment is accomplished by shifting elements in order to increase effectiveness. Regeneration is the rebuilding of decimated units.

REFERENCES

REQUIRED PUBLICATIONS

Required publications are sources that users must read in order to understand or to comply with this publication.

Department of the Army Pamphlets (DA Pam)

50-3 *The Effects of Nuclear Weapons.*

Field Manuals (FM)

3-Series Includes all FM 3-series manuals.

3-3 *Chemical and Biological Contamination Avoidance.* This manual discusses in detail the four stages of contamination avoidance: implementation of passive defensive measures, oral reporting of attacks, location and identification of hazards, and limitation of exposure to hazards.

3-3-1 *Nuclear Contamination Avoidance.* This is the tactics, techniques, and procedures manual for nuclear contamination avoidance.

3-4 *NBC Protection.* This manual addresses unit and individual protection measures. See Chapter 4 for a detailed discussion of individual protection.

3-5 *NBC Decontamination.* This manual defines and clarifies the entire process of NBC decontamination. It shows how contaminated forces can survive, sustain, or restore their combat potential.

3-15 *Nuclear Accident and Incident Response and Assistance.* This manual contains guidance for training, equipping, and utilizing emergency teams for contamination control. It covers procedures and techniques for limiting radiation hazards.

3-100 *NBC Operations.* This manual provides leaders with the basic information they will need to help units survive and accomplish their missions on a nuclear battlefield.

6-20-10 *Tactics, Techniques, and Procedures for the Targeting Process.* This manual describes D^3A targeting processes.

10-1 *Quartermaster Principles.*

12-6 *Personnel Doctrine.*

25-50 *Nuclear Survivability Training.*

63-3 *Corps Support Command.*

100-5 *Operations.* This is the Army's keystone operations manual.

100-7 *The Army in Theater Operations.*

100-9 *Reconstitution.*

100-10 *Combat Service Support.*

100-15 *Corps Operations.* This manual contains operational-level doctrine to corps commanders and staffs.

100-16 *Army Operational Support.*

100-17 *Mobilization, Deployment, Redeployment, Demobilization.*

Joint Publications (JP)

1-02 *Department of Defense Dictionary of Military and Associated Terms.*

3-12 *Doctrine for Joint Nuclear Operations.* This publication sets forth doctrine for the combatant commander to use for the conduct of joint nuclear operations. It guides the joint planning and employment of US nuclear forces.

3-12.1 *Doctrine for Joint Nonstrategic Nuclear Weapons Employment.* This publication provides guidance for nuclear-weapons employment. Doctrine and guidance apply to the commander of combatant commands, subordinate unified commands, joint task forces, and subordinate components of these commands.

3-12.2 (SRD) *Nuclear Weapons Employment and Effects Data* (U). This publication sets forth doctrine and selected TTP for joint operations and training. It is the accepted joint standard for nuclear target analysis, employment procedures, and the source for nuclear effects data.

3-12.3 *Nuclear Weapons Employment and Effects Data.*

Department of Defense Nuclear Agency Effects Manuals (DNA EM)

1 (SRD) Chapter l0 Electromagnetic Pulse.

Chapter 14 Effects of Personnel.

Chapter 15 Damage to Structures.

Chapter 17 Damage to Military Field Equipment.

Chapter 21 Damage to Missiles.

NOTE: DNA is now known as the Defense Special Weapons Agency (DWA).

RELATED PUBLICATIONS

Related publications are sources of additional information. They are not required in order to understand this publication.

Allied Tactical Publications (ATP)

35A *Land Force Tactical Doctrine.* This publication establishes common NATO doctrine for the use of land force commanders in military operations when NATO forces are placed under their command.

45 *Reporting Nuclear Detonation, Biological and Chemical Attacks, and Predicting and Warning of Associated Hazards and Hazard Areas.* This publication contains procedures for reporting nuclear detonations, radioactive fallout, biological and chemical attacks, and for predicting associated hazards.

Army Medical Publications (AMedP)

6 *NATO Handbook on the Medical Aspects of NBC Defensive Operations.*

7 *Concept of Operations of Medical Support in an NBC Environment.*

8 *Planning Guide for the Estimation of Battle Casualties (Nuclear).*

Field Manuals (FM)

3-7 *NBC Handbook.* This manual provides information on the NBC warning and reporting system, contamination avoidance, and protection and decontamination.

5-103 *Survivability.* This manual integrates survivability into overall operations. It is for combined arms and engineer commanders.

8-9 *NATO Handbook on the Medical Aspects of NBC Defensive Operations.*

8-10-7 *Health Service Support in a Nuclear, Biological, and Chemical Environment.*

Joint Publications (JP)

5-03.1, Vol I *Joint Operations Planning and Execution System* (JOPES).

6, Vol II (SRD) *Standing Operating Procedures for the Coordination of Atomic Operations* (U).

(TS) Joint Strategic Capabilities Plans

Annex C *Nuclear Operations.*

Technical Manuals (TM)

39-4-1 *Glossary of Nuclear Weapons Material and Related Terms.*

OTHER PUBLICATIONS

Allied Administrative Publications (AAP)

NATO Standardization Agreements and Allied Publications. This publication lists STANAGs and other publications of interest to NATO.

Department of the Army Forms (DF)

2028 *Recommended Changes to Publications and Blank Forms.*

Field Manuals (FM)

6-20	*Fire Support in Combined Arms Operations.* This is the keystone manual containing the principles of fire support.
34-1	*Intelligence Electronic Warfare Operations.*
34-40	*Electronic Warfare Operations.*
44-100	*Air Defense Operations.*
71-100	*Division Operations.* This manual describes how armored and mechanized divisions and brigades are organized and how they fight.
100-1	*The Army*. This manual covers the roles, principles, and precepts governing the employment of Army forces in support of national security objectives.

SUGGESTED READINGS

Suggested readings are significant works for additional study and reflection.

Standardization Agreements (STANAG)

2002	Warning Signs for Marking of Contaminated or Dangerous Land Areas, Complete Equipment, Supplies, and Stores.
2047	Emergency Alarms of Hazard or Attack (NBC and Air Attack only).
2083	Commander's Guide on Radiation Exposure of Groups.
2103	Reporting Nuclear Detonations, Biological and Chemical Attacks, and Predicting and Warning of Associated Hazards and Hazard Areas. *(See also* ATP-45.)
2104	Friendly Nuclear Strike Warning.
2111	Target Analysis—Nuclear Weapons.
2112	NBC Reconnaissance.
2150	NATO Standards of Proficiency for NBC Defense.
2352	NBC Defense Equipment Operational Guidelines.
2353	Evaluation of NBC Defense Capabilities.
2358	First Aid and Hygiene Training in NBC Operations.
2367	NATO Glossary of NBC Terms and Definitions.
2435	NBC Protection Measures for Commodities Within Supply Channels.
2500	NATO Handbook on the Medical Aspects of NBC Defense Operations.
2874	Planning Guide for Estimation of Battle Casualties (Nuclear).
2910	Nuclear Casualties and Damage Assessment for Exercises.

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